

# PATENT ABSTRACTS OF JAPAN

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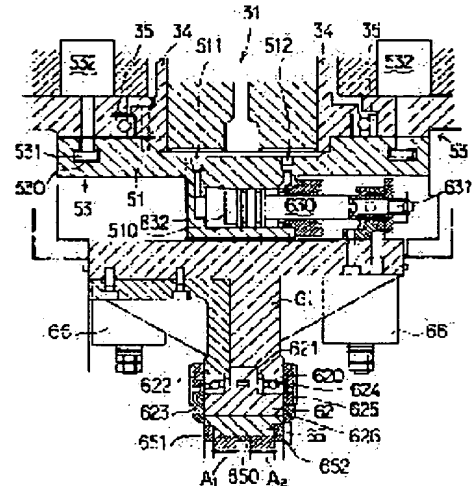
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## (54) GEAR FINISHING DEVICE

### (57)Abstract:

**PURPOSE:** To speedily continue finishing by sliding a working part to hold and rotate a finishing grinding stone in parallel with an axis of the finishing grinding stone and fixing it at a sliding position.

**CONSTITUTION:** Before stating finishing, two pieces of finishing grinding stones A1, A2 are attached to a grinding stone holding ring 65. At the time of this attachment, dressing for precise positional adjustment and attachment error correction of the grinding stones is carried out to both of the grinding stones A1, A2 previously. In the case when the grinding stone A1 is worn due to repetition of finishing, a frame 61 is slid by actuating a sliding device, and the other grinding stone A2 is made to reach a machining position. Consequently, it is possible to continue finishing with a new grinding stone without changing grinding stones with removal of them.



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CLAIMS

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[Claim(s)]

3/  
1  
2  
[Claim 1] It is gearing finish equipment which carries out finish of the processed gearing which meshed to this finishing whetstone by rotating an internal-tooth mold finishing whetstone. A machine stool, The supporting structure which is supported by this machine stool and holds a processed gearing, and the sliding equipment supported by the machine stool so that approach estrangement could be carried out to an abbreviation perpendicular direction to the processed gearing on this supporting structure at this gearing's axis, It is supported by this sliding equipment and has the grinding stone supporting structure which holds a finishing whetstone pivotable so that it may have a crossed axes angle to a processed gearing. This grinding stone supporting structure The bond part combined with the surroundings of an axis parallel to the sliding direction of this sliding equipment rotatable to said sliding equipment, The actuation section which holds a finishing whetstone in the location of said crossed axes angle, and can slide in parallel with the axis of said finishing whetstone to said bond part, With the fixed part for fixing this actuation section to said bond part in a sliding location, and the gearing for grinding stone rotation which makes the shape of a circular ring, has a periphery gear tooth, held the finishing whetstone inside, and was supported by said actuation section pivotable at the circumference of a medial-axis line It is gearing finish equipment which is equipped with the rotation mechanical component which said actuation section is equipped with, gears for the periphery gear tooth of said gearing for grinding stone rotation, and drives this gearing for grinding stone rotation, and is characterized by for this gearing for grinding stone rotation to have the width of face and the stop section which arrange in parallel two or more finishing whetstones inside, and can support and fix them to it in said direction of a grinding stone axis.

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[Translation done.]

CP,01-024034,A [DETAILED DESCRIPTION] 1/4

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the gearing finish equipment which carries out finish of the processed gearing which meshed to this finishing whetstone by rotating an internal-tooth mold finishing whetstone.

[0002]

[Description of the Prior Art] When tooth form precision with an expensive gearing is required, finish which corrects deformation of the heat-treated gearing, and the so-called honing are performed. This finish corrects the shape of tooth form by making it rotate, where an internal-tooth mold finishing whetstone is meshed with a fixed crossed axes angle to a processed gearing. A finishing whetstone is held at the gearing for grinding stone rotation with a nothing periphery gear tooth for the shape of a circular ring, and this gearing for grinding stone rotation is rotated by the driving gear which gets into gear for a periphery gear tooth, and performs sliding actuation for performing infed to a processed gearing. By the time it completes correction of tooth form, it will usually continue for many counts of 100 times from one tooth contact 20 of a finishing whetstone, and the gear tooth of a processed gearing and engagement will be repeated. Therefore, generally the life of a finishing whetstone is short.

[0003] Conventional gearing finish equipment had equipped with one finishing whetstone to the gearing for grinding stone rotation. Therefore, whenever it reached the life of a grinding stone, equipment needed to be suspended, and it needed to exchange for a new grinding stone. In this case, when close dimensional accuracy was required of wearing of a grinding stone and prudent installation was required, in order to correct the error of the installation location of the finishing whetstone resulting from a clearance unescapable to installation, the dressing needed to be performed after installation. Therefore, the rate that the time amount which exchange of a finishing whetstone takes occupies to the inside of a gearing's whole finish was large, and the shortening and simplification of time and effort were demanded.

[0004]

[Problem(s) to be Solved by the Invention] This invention exchanges a gearing finishing whetstone rationally responding to such a request, and aims at offering the gearing finish equipment which can measure compaction of the time amount, and simplification of time and effort.

[0005]

[Means for Solving the Problem] Said purpose of this invention is gearing finish equipment which carries out finish of the processed gearing which meshed to this finishing whetstone by rotating an internal-tooth mold finishing whetstone. A machine stool, The supporting structure which is supported by this machine stool and holds a processed gearing, and the sliding equipment supported by the machine stool so that approach estrangement could be carried out to an abbreviation perpendicular direction to the processed gearing on this supporting structure at this gearing's axis. It is supported by this sliding equipment and has the grinding stone supporting structure which holds a finishing whetstone pivotable so that it may have a crossed axes angle to a processed gearing. This grinding stone supporting structure The bond part combined with

the surroundings of an axis parallel to the sliding direction of this sliding equipment rotatable to said sliding equipment. The actuation section which holds a finishing whetstone in the location of said crossed axes angle, and can slide in parallel with the axis of said finishing whetstone to said bond part. With the fixed part for fixing this actuation section to said bond part in a sliding location, and the gearing for grinding stone rotation which makes the shape of a circular ring, has a periphery gear tooth, held the finishing whetstone inside, and was supported by said actuation section pivotable at the circumference of a medial-axis line. It has the rotation mechanical component which said actuation section is equipped with, gears for the periphery gear tooth of said gearing for grinding stone rotation, and drives this gearing for grinding stone rotation. This gearing for grinding stone rotation is attained by the gearing finish equipment characterized by having the width of face and the stop section which arrange in parallel two or more finishing whetstones inside, and can support and fix them to it in said direction of a grinding stone axis.

[0006]

[Example] Hereafter, it explains about the example of this invention, referring to an accompanying drawing. The gearing finish equipment shown in drawing 3 from drawing 1 is equipped with the machine stool 10 with the drive motor 13 which slides the table 12 prepared possible [ sliding ] on the foundation 11, and this table. The supporting structure 20 is arranged on the table 12. The supporting structure 20 is equipped with two sets of the tail stock 21 and 22 which can slide in the table sliding direction in parallel, and the driving cylinders 23 and 24 which slide these tail stock. Behind the table 12 in a foundation 11 (method of the right in drawing 2 ), the sliding equipment 30 supported by the axis of tail stock so that approach estrangement could be carried out mostly perpendicularly is arranged. Sliding equipment 30 is equipped with the sliding object 31 which slides on the guide-rail 14 top on a foundation 11, the drive motor 32 which drives this sliding object, and the transmission section 33 which changes and tells rotation of the output shaft of a drive motor to reciprocation of the sliding object 31. The front end side of the sliding object 31 is equipped with the grinding stone supporting structure 40.

[0007] The grinding stone supporting structure 40 is equipped with the bond part 50 combined with the front end side of the sliding object 31, and the actuation section 60 supported by this bond part. These details are shown in drawing 6 from drawing 4 . The bond part 50 is equipped with the base material 51 supported from the front end of the sliding object 31 pivotable through bearing 35 to the support shaft 34 prolonged to the front at the circumference of this support shaft. The anterior part of the sliding object 31 is equipped with the drive motor 52 ( drawing 2 ), and by gearing with the worm gear with which the output shaft of a drive motor 52 was equipped, the rack (not shown) attached in the base material 51 drives a base material 51 and the support shaft 34, and rotates them inside the sliding object 31. The fixed part 53 to rotation of a base material is formed in the part which the front end side of the sliding object 31 and the tooth back of a base material 51 touch. The fixed part 53 narrowed the outside which extended in the hand of cut of a base material 51, and was opened at the tooth back of this base material, and is equipped with the oil hydraulic cylinder equipment 532 which the sliding object 31 supported [ equipment ] the cylinder section, and the plunger 531 was extended [ equipment ] to the direction of a base material 51, and made the point engage with the slot 530 on formal in a slot 530. By retreating a plunger 531 by the hydraulic drive, a fixed part 53 is fixed so that it may have a high pressure in the wall of a slot 530, it may engage with it and a base material 51 may not be rotated. The actuation section 60 is equipped with the frame 61 supported by the bond part 50 possible [ sliding of the direction of a grinding stone axis mentioned later ], the gearing 62 for grinding stone rotation which is supported by this frame and holds a finishing whetstone inside, the sliding equipment 63 for sliding a frame 61, and the fixed part 66 which fixes a frame 61 in a sliding location. The frame 61 is equipped with the piece 600 of a stop stopped so that the vertical edge of a base material 53 may be surrounded in the vertical direction, is guided along with the vertical edge of a base material 53, and slides. The frame 61 is greatly prolonged so that the processed gearing W may be surrounded from a bond part with a base material 53 to the front. The opening 610 of a major diameter is formed in the anterior part of a frame 61, and this opening is equipped with the gearing 62 for grinding stone rotation. As shown in drawing 5

and drawing 7, it is equipped with the gearing 62 for grinding stone rotation pivotable to the frame 61 through bearing 620. The gearing 62 for grinding stone rotation has the gear tooth 621 in the peripheral face. The upper part of a frame 61 is equipped with the mechanical component 64 equipped with the motor, and the chain 641 was prolonged from the sprocket 640 combined with the output shaft, and it has geared for the gear tooth 621 of the gearing 62 for grinding stone rotation. Inside the gearing 62 for grinding stone rotation, the ring 65 for grinding stone maintenance is inserted. Mutual association of a frame 61, the gearing 62 for grinding stone rotation, and the ring 65 for grinding stone maintenance is performed by \*\*\*\*ing and carrying out the stop of the rings 622 and 623 for immobilization to one side face, and \*\*\*\*ing and carrying out the stop of the rings 624, 625, and 626 for immobilization to the side face of another side, as shown in drawing 5. The ring 65 for grinding stone maintenance has the projection 650 for a stop in the center section of the direction of an axis, and the both sides serve as a path corresponding to the outer diameter of the grinding stone which should be held. The rings 651 and 652 for immobilization are put, a stop is \*\*\*\*ed and carried out to the ring 65 for grinding stone maintenance, and grinding stones A1 and A2 are fixed to the periphery of the grinding stones A1 and A2 inserted in the both sides of the projection 650 for a stop. The posterior part of a frame 61 is equipped with the piston 630 of sliding equipment 63 as shown in drawing 4 and drawing 5. It is fixed to a frame 61, and the end 631 of a piston inserts the other end in the cylinder section 510 formed in the base material 51 of a bond part 50 free [sliding], and constitutes the piston head 632. In the cylinder section 510, the conveyance-of-oil ways 511 and 512 which are open for free passage to the hydraulic power unit outside drawing have extended. Therefore, by feeding hydraulic oil to the conveyance-of-oil way 511 or 512, a piston 630 can be moved and a frame 61 can be slid to a bond part 50. The locking device 66 is formed in the part which the base material 53 and frame 61 of a bond part touch. It narrows in the sliding section 53 the outside which extends in the sliding direction of a frame 61, and the slot 513 on the mold is formed in it. The plunger 660 with which a point is made to engage, and the oil hydraulic cylinder 661 to which forward/backward moving of this plunger is carried out are formed in this slot at the back end section of a frame 61. By operating an oil hydraulic cylinder 661, a plunger 660 retreats, engages with a slot 513 with a high pressure, and, thereby, fixes a frame 61 to the sliding object 51. This locking device 66 is formed in four places of a frame 61, as shown in drawing 6.

[0008] This gearing finish equipment operates as follows. First, before beginning finish, the grinding stone retaining ring 65 is equipped with two finishing whetstones A1 and A2. The dressing for precise justification of a grinding stone and an installation sector of calibration is performed to both grinding stones in the case of this wearing. To a processed gearing, Aba is attached so that it may project to both sides, the both ends of this Aba are pinched by tail stock 21 and 22, and a processed gearing is fixed on a table. At this time, the sliding object 31 is in the retreat location shown in drawing 2. From this condition, the sliding object 30 is advanced with a drive motor 32, and a finishing whetstone A1 or A2 is meshed with a processed gearing. Next, a mechanical component 64 is operated, the gearing for grinding stone rotation is rotated with a finishing whetstone, the predetermined infeed depth sliding object 31 is advanced, and it goes. If finish of a processed gearing is completed by rotation of a finishing whetstone, and suitable repetition of reciprocation of a table 12, a mechanical component 64 will be stopped, the sliding object 31 will be retreated, the clamp by tail stock 21 and 22 will be canceled, and a processed gearing will be taken out.

[0009] When one grinding stone (for example, A1) is worn out by the repeat of finish, sliding equipment 63 is operated, a frame 61 is slid, and the grinding stone (for example, A2) of another side is made to reach a processing location. Thereby, the finish by the new grinding stone can be continued, without carrying out exchange accompanied by removal of a finishing whetstone.

[0010] Although the above example showed the thing equipped with two finishing whetstones of a type, wearing of three or more finishing whetstones can also be enabled by changing a grinding stone retaining ring etc. suitably. Drawing 8 shows the example of such a grinding stone retaining ring. This grinding stone retaining ring 65' equips the distance of 1/about 3 with the projection 653 for a stop in the direction of an axis from one side edge side. The ring 655 for a stop is put

in the direction of an axis [redacted] the location of the distance of 1/about 3 [redacted] from the side edge side of another side of grinding stone retaining ring 65'. Installation of a grinding stone inserts grinding stones A1 and A2 in the both sides of the projection 653 for a stop, where the ring 655 for a stop is removed, and it puts the ring 655 for a stop after that. Furthermore, grinding stone A3 is inserted in until it contacts the ring 655 for a stop, and the stop of the end face of the both sides of grinding stone retaining ring 65' and a grinding stone A1, and the stop rings 657 and 658 over the periphery of A3 is \*\*\*\*ed and carried out. Thereby, it can equip with three finishing whetstones. spacing which makes a grinding stone retaining ring double width further, and is equivalent to the width of face of a grinding stone in the ring 655 for a stop in order to equip with more finishing whetstones -- \*\*\*\* -- only a required number can be attached -- then, it is good.

3/16 [0011] Moreover, without carrying out exchange accompanied by removal of a finishing whetstone to the thing from which a class differs two or more finishing whetstones with which this finish equipment is equipped, then a processed gearing of a different kind, it can be coped with quickly and required processing can be performed. In this case, finish to a gearing of a different kind can be automatically performed by forming the control unit which controls the location of the sliding section with the identification unit to a processed gearing of a different kind, and its discernment.

[0012]

[Effect of the Invention] In the gearing finish equipment concerning this invention, the gearing for grinding stone rotation held by the grinding stone supporting structure has structure which arranges in parallel two or more finishing whetstones inside, and can carry out support immobilization. Furthermore, a grinding stone attaching part enables in parallel sliding of the actuation section which you hold [ section ] a finishing whetstone and makes it rotate at the axis of a finishing whetstone, and is enabling immobilization of it in the sliding location. Therefore, if it justifies by equipping the gearing for grinding stone rotation with two or more finishing whetstones at the beginning, when one finish gearing is worn out, the new finishing whetstone already justified by sliding the actuation section of the grinding stone supporting structure, and fixing can be made to reach a processing location, and finish can be continued quickly. Thus, justification of two or more grinding stones is summarized beforehand, and is performed, since after processing initiation can carry out location \*\*\*\* of the worn-out finishing whetstone quickly by sliding of the actuation section, it can rationalize wearing of a grinding stone and the activity of finish, and speeding up of the whole activity and the simplification of activity time and effort of it are attained.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the front view of the gearing finish equipment concerning one example of this invention.

[Drawing 2] It is the side elevation of the gearing finish equipment shown in drawing 1 .

[Drawing 3] It is the top view of the gearing finish equipment shown in drawing 1 .

[Drawing 4] It is the side elevation showing the grinding stone attaching part in the gearing finish equipment shown in drawing 1 in a detail.

[Drawing 5] It is the top view of the grinding stone supporting structure shown in drawing 4 .

[Drawing 6] It is the front view of the grinding stone supporting structure shown in drawing 4 .

[Drawing 7] It is . sectional view showing the gearing for grinding stone rotation in the gearing finish equipment shown in drawing 1 , and its near in a detail.

[Drawing 8] It is drawing of longitudinal section showing other examples of the grinding stone retaining ring with which the gearing for grinding stone rotation was equipped.

[Description of Notations]

10 Machine Stool

12 Table

20 Supporting Structure

21 22 Tail stock

30 Sliding Equipment

31 Sliding Object

40 Grinding Stone Supporting Structure

50 Bond Part

51 Base Material

53 Fixed Part

60 Actuation Section

61 Frame

62 Gearing for Grinding Stone Rotation

63 Sliding Equipment

64 Mechanical Component

65 Grinding Stone Retaining Ring

621 Gear Tooth (Periphery Gear Tooth)

630 Piston

650 Projection for Stop

651 652 Stop ring

A1, A2, A3 Finishing whetstone

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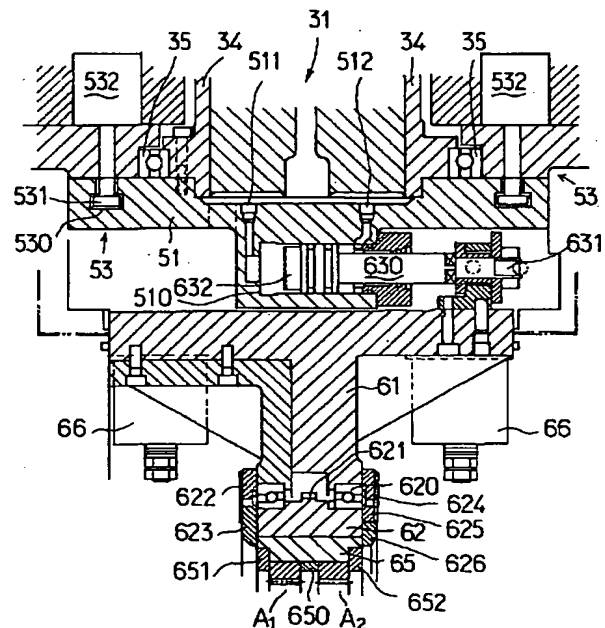
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(54) 【発明の名称】 歯車仕上装置

(57) 【要約】

【構成】 砥石保持装置により保持される砥石回転用歯車が内側に複数の仕上砥石を並列して支持固定し得る構造であり、砥石保持部は、仕上砥石を保持し回転させる作動部を仕上砥石の軸線に平行に摺動可能とし、摺動位置で固定可能とした歯車仕上装置。

【効果】 最初に複数の仕上砥石を砥石回転用歯車に装着し位置調整を行っておけば、1つの仕上歯車が磨耗した際に砥石保持装置の作動部を摺動させ固定することによりすでに位置調整された新たな仕上砥石を加工位置に至らしめることができ、迅速に仕上加工を継続することができる。また、異種の仕上歯車を装着しておくことにより、異種の被加工歯車のための段取り時間を短縮することができる。





## 【特許請求の範囲】

【請求項1】 内歯型仕上砥石を回転させることにより該仕上砥石に啮合した被加工歯車を仕上加工する歯車仕上装置であって、機台と、該機台に支持され被加工歯車を保持する保持装置と、該保持装置上の被加工歯車に対し該歯車の軸線に略垂直方向に接近離反し得るように機台に支持された摺動装置と、該摺動装置に支持され仕上砥石を被加工歯車に対して交差角を持つように回転可能に保持する砥石保持装置とを備え、該砥石保持装置は、前記摺動装置に対し該摺動装置の摺動方向に平行な軸線の回りに回転可能に結合された結合部と、仕上砥石を前記交差角の位置に保持して前記結合部に対し前記仕上砥石の軸線に平行に摺動し得る作動部と、摺動位置で該作動部を前記結合部に固定するための固定部と、円環状をなして外周歯を有し内側に仕上砥石を保持し中心軸線回りに回転可能に前記作動部に支持された砥石回転用歯車と、前記作動部に装着され前記砥石回転用歯車の外周歯に啮合して該砥石回転用歯車を駆動する回転駆動部とを備え、該砥石回転用歯車は、内側に複数の仕上砥石を前記砥石軸線方向に並列して支持し固定し得る幅及び係止部を有していることを特徴とする歯車仕上装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、内歯型仕上砥石を回転させることにより該仕上砥石に啮合した被加工歯車を仕上加工する歯車仕上装置に関する。

## 【0002】

【従来技術及びその問題点】歯車の高い歯形精度が要求される場合は、熱処理された歯車の変形を矯正する仕上加工、所謂ホーニング加工が施される。この仕上加工は、被加工歯車に対して内歯型仕上砥石を一定の交差角をもって啮合させた状態で回転させることにより、歯形状を修正するものである。仕上砥石は、円環状をなし外周歯を有した砥石回転用歯車に保持され、該砥石回転用歯車は外周歯に啮合する駆動装置により回転させられ、被加工歯車への切込みを行うための摺動動作を行う。歯形の修正を完了するまでには、通常仕上砥石の一つの歯当たり20から100回という多くの回数に亘って被加工歯車の歯と啮合を繰り返す。従って、仕上砥石の寿命は一般に短い。

【0003】従来の歯車仕上装置は、砥石回転用歯車に対し1個の仕上砥石を装着していた。従って、砥石の寿命に達する度に装置を停止し、新たな砥石と交換する必要があった。この場合、砥石の装着には高い寸法精度が要求され、慎重な取り付け作業が要求される上、取り付けに不可避な隙間に起因する仕上砥石の取り付け位置の誤差を修正するため、取り付け後にドレッシングを行う必要があった。従って、仕上砥石の交換に要する時間

が、歯車の仕上加工全体の内に占める割合が大きく、その短縮化及び手間の簡略化が要請されていた。

## 【0004】

【発明が解決しようとする課題】本発明は、このような要請に答え歯車仕上砥石の交換を合理的に行い、その時間の短縮及び手間の簡略化を計り得る歯車仕上装置を提供することを目的とする。

## 【0005】

【問題点を解決するための手段】本発明の前記目的は、  
10 内歯型仕上砥石を回転させることにより該仕上砥石に啮合した被加工歯車を仕上加工する歯車仕上装置であって、機台と、該機台に支持され被加工歯車を保持する保持装置と、該保持装置上の被加工歯車に対し該歯車の軸線に略垂直方向に接近離反し得るように機台に支持された摺動装置と、該摺動装置に支持され仕上砥石を被加工歯車に対して交差角を持つように回転可能に保持する砥石保持装置とを備え、該砥石保持装置は、前記摺動装置に対し該摺動装置の摺動方向に平行な軸線の回りに回転可能に結合された結合部と、仕上砥石を前記交差角の位置に保持して前記結合部に対し前記仕上砥石の軸線に平行に摺動し得る作動部と、摺動位置で該作動部を前記結合部に固定するための固定部と、円環状をなして外周歯を有し内側に仕上砥石を保持し中心軸線回りに回転可能に前記作動部に支持された砥石回転用歯車と、前記作動部に装着され前記砥石回転用歯車の外周歯に啮合して該砥石回転用歯車を駆動する回転駆動部とを備え、該砥石回転用歯車は、内側に複数の仕上砥石を前記砥石軸線方向に並列して支持し固定し得る幅及び係止部を有していることを特徴とする歯車仕上装置により達成される。

## 【0006】

【実施例】以下、本発明の実施例につき、添付図面を参照しつつ説明する。図1から図3に示す歯車仕上装置は、土台11の上に摺動可能に設けられたテーブル12、及び該テーブルを摺動させる駆動モータ13を有した機台10を備えている。テーブル12の上には保持装置20が配置されている。保持装置20は、テーブル摺動方向に平行に摺動可能な2台の心押台21、22と、これらの心押台を摺動させる駆動シリンダ23、24とを備えている。土台11におけるテーブル12の後方（図2における右方）には、心押台の軸線にほぼ垂直方向に接近離反し得るように支持された摺動装置30が配置されている。摺動装置30は、土台11上のガイドレール14上を摺動する摺動体31と、該摺動体を駆動する駆動モータ32と、駆動モータの出力軸の回転を摺動体31の往復動に変換して伝える伝動部33とを備えている。摺動体31の前端面には砥石保持装置40が装着されている。

【0007】砥石保持装置40は、摺動体31の前端面に結合された結合部50と、該結合部に支持された作動部60とを備えている。これらの詳細を図4から図6に

示す。結合部50は、摺動体31の前端から前方へ延びる支持軸34に対し、ベアリング35を介して該支持軸周りに回転可能に支持された支持体51を備えている。摺動体31の前部には駆動モータ52（図2）が装着されており、支持体51に取り付けられたラック（図示せず）が、駆動モータ52の出力軸に装着されたウォームギアと啮合することにより、支持体51及び支持軸34は駆動され、摺動体31の内部で回転する。摺動体31の前端面と支持体51の背面とが接する部分には支持体の回転に対する固定部53が設けられている。固定部53は、支持体51の回転方向に延び該支持体の背面に開いた外窄まり形の溝530と、シリンダー部を摺動体31に支持され、プランジャー531を支持体51の方に延ばし先端部を溝530に係合させた油圧シリンダ装置532とを備えている。固定部53は、油圧駆動によりプランジャー531を後退させることにより、溝530の壁に高い圧力を持って係合し支持体51を回転しないように固定する。作動部60は、後述する砥石軸線方向に摺動可能に結合部50に支持されたフレーム61と、該フレームに支持され内側に仕上砥石を保持する砥石回転用歯車62と、フレーム61を摺動させるための摺動装置63と、フレーム61を摺動位置で固定する固定部66とを備えている。フレーム61は、支持体53の上下端縁を上下方向に囲むように係止する係止片600を備えており、支持体53の上下端縁に沿って案内され摺動する。フレーム61は支持体53との結合部から前方へ被加工歯車Wを囲むように大きく延びている。フレーム61の前部には大径の開口部610が設けられ、該開口部に砥石回転用歯車62が装着されている。砥石回転用歯車62は、図5及び図7に示すようにベアリング620を介してフレーム61に対し回転可能に装着されている。砥石回転用歯車62は、外周面に歯621を有している。フレーム61の上部にはモータを備えた駆動部64が装着されており、その出力軸に結合されたスプロケット640からチェーン641が延び砥石回転用歯車62の歯621に啮合している。砥石回転用歯車62の内側には砥石保持用リング65が嵌入されている。フレーム61、砥石回転用歯車62及び砥石保持用リング65の相互の結合は図5に示すように、一方の側面に固定用リング622、623をねじ止めし、他方の側面に固定用リング624、625、626をねじ止めすることにより行なわれる。砥石保持用リング65は軸線方向の中央部に係止用突起650を有しており、その両側は保持すべき砥石の外径に対応した径となっている。係止用突起650の両側に嵌入された砥石A1、A2の周縁には、固定用リング651、652が被着され、砥石保持用リング65にねじ止めされ、砥石A1、A2を固定する。フレーム61の後部には、図4及び図5に示すように摺動装置63のピストン630が装着されている。ピストンの一端631はフレーム61に固定され、他端は

結合部50の支持体51に形成されたシリンダー部510に摺動自在に嵌入しピストンヘッド632を構成している。シリンダー部510には、図外の油圧装置に連通する送油路511、512が延びている。従って送油路511又は512に作動油を圧送することにより、ピストン630を移動させてフレーム61を結合部50に対して摺動させることができる。結合部の支持体53とフレーム61とが接する部分には固定装置66が形成されている。摺動部53には、フレーム61の摺動方向に延びる外すばまり型の溝513が形成されている。フレーム61の後端部には、該溝に先端部を係合させるプランジャ660と、該プランジャを進退動させる油圧シリンダ661とが設けられている。油圧シリンダ661を作動させることにより、プランジャ660は後退して溝513に高い圧力を伴って係合し、これによりフレーム61を摺動体51に対して固定する。この固定装置66は、図6に示すように、フレーム61の4か所に設けられている。

【0008】この歯車仕上装置は次のように作動する。まず、仕上加工を始める前に、2個の仕上砥石A1、A2を砥石保持リング65に装着する。この装着の際に砥石の精密な位置調整及び取り付け誤差修正のためのドレッシングを、双方の砥石に対して行なっておく。被加工歯車に対し、アーバを両側へ突出するように取り付け、該アーバの両端部を心押台21、22により挟持して被加工歯車をテーブル上に固定する。この時、摺動体31は、図2に示す後退位置にある。この状態から、駆動モータ32により摺動体30を前進させ、仕上砥石A1又はA2を被加工歯車に啮合させる。次に駆動部64を作動させ、砥石回転用歯車を仕上砥石と共に回転させ、所定の切込み深さ迄摺動体31を前進させて行く。仕上砥石の回転及びテーブル12の往復動の適切な繰返しにより被加工歯車の仕上が完了すると、駆動部64を停止させ、摺動体31を後退させ、心押台21、22によるクランプを解除して、被加工歯車を取り出す。

【0009】仕上加工の繰返しにより一方の砥石（例えばA1）が磨耗した場合は、摺動装置63を作動させてフレーム61を摺動させ、他方の砥石（例えばA2）を加工位置に至らしめる。これにより、仕上砥石の取り外しを伴った交換をすることなく、新たな砥石による仕上加工を継続することができる。

【0010】以上の例では2個の仕上砥石を装着するタイプのものを示したが、砥石保持リング等を適宜変更することにより、3個以上の仕上砥石を装着可能とすることもできる。図8は、このような砥石保持リングの例を示している。この砥石保持リング65'は、一方の側端面から軸線方向にほぼ3分の1の距離に、係止用突起653を備えている。砥石保持リング65'の他方の側端面から軸線方向にほぼ3分の1の距離の位置には、係止用リング655が嵌め入れられている。砥石の取り付け

は、係止用リング655を取り外した状態で係止用突起653の両側に砥石A1、A2を嵌め入れ、その後係止用リング655を嵌め入れる。更に砥石A3を係止用リング655に当接するまで嵌め入れて、砥石保持リング65'の両側の端面及び砥石A1、A3の周縁に跨がる固定リング657、658をねじ止める。これにより3個の仕上砥石を装着することができる。より多くの仕上砥石を装着するには、砥石保持リングを更に広幅とし、係止用リング655を砥石の幅に相当する間隔を於て必要な数だけ取り付け可能とすればよい。

【0011】また、本仕上装置に装着される複数の仕上砥石を種類の異なるものとすれば、異種の被加工歯車に対して仕上砥石の取り外しを伴う交換をすることなく、必要な加工を迅速に対処して行うことができる。この場合、異種の被加工歯車に対する識別装置及びその識別に伴って摺動部の位置を制御する制御装置を設けることにより、異種の歯車に対する仕上加工を自動的に行うことができる。

【0012】

【発明の効果】本発明に係る歯車仕上装置においては、砥石保持装置により保持される砥石回転用歯車が内側に複数の仕上砥石を並列して支持固定し得る構造となっている。さらに砥石保持部は、仕上砥石を保持し回転させる作動部を仕上砥石の軸線に平行に摺動可能とし、摺動位置で固定可能としている。従って、最初に複数の仕上砥石を砥石回転用歯車に装着し位置調整を行っておけば、1つの仕上歯車が磨耗した際に砥石保持装置の作動部を摺動させ固定することによりすでに位置調整された新たな仕上砥石を加工位置に至らしめることができ、迅速に仕上加工を継続することができる。このように複数の砥石の位置調整を予め纏めて行い、加工開始後は磨耗した仕上砥石を作動部の摺動により迅速に位置変えることができるので、砥石の装着と仕上加工の作業を合理化することができ、作業全体の迅速化及び作業手間の簡略化が可能となる。

\*【図面の簡単な説明】

【図1】本発明の一実施例に係る歯車仕上装置の正面図である。

【図2】図1に示す歯車仕上装置の側面図である。

【図3】図1に示す歯車仕上装置の平面図である。

【図4】図1に示す歯車仕上装置における砥石保持部を詳細に示す側面図である。

【図5】図4に示す砥石保持装置の平面図である。

【図6】図4に示す砥石保持装置の正面図である。

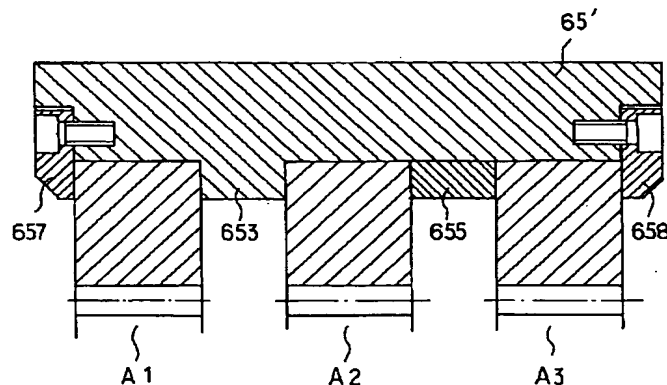
10 【図7】図1に示す歯車仕上装置における砥石回転用歯車及びその近傍を詳細に示す、断面図である。

【図8】砥石回転用歯車に装着された砥石保持リングの他の例を示す縦断面図である。

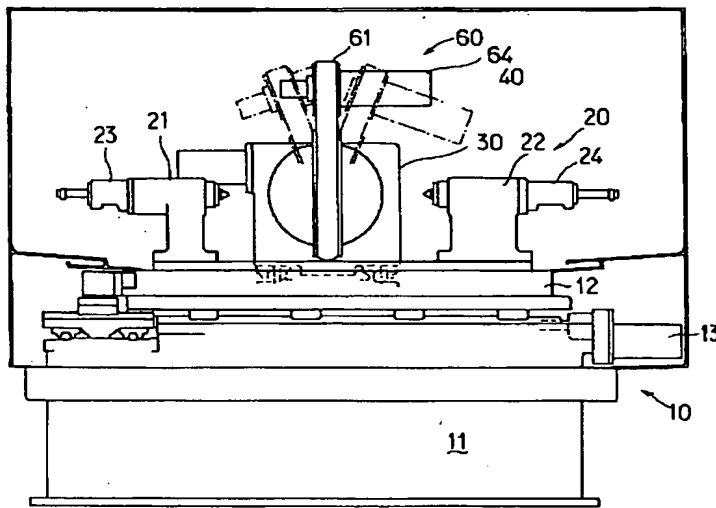
【符号の説明】

- 10 機台
- 12 テーブル
- 20 保持装置
- 21、22 心押台
- 30 摺動装置
- 31 摺動体
- 40 砥石保持装置
- 50 結合部
- 51 支持体
- 53 固定部
- 60 作動部
- 61 フレーム
- 62 砥石回転用歯車
- 63 摺動装置
- 64 駆動部
- 30 65 砥石保持リング
- 621 歯（外周歯）
- 630 ピストン
- 650 係止用突起
- 651、652 固定リング
- \* A1、A2、A3 仕上砥石

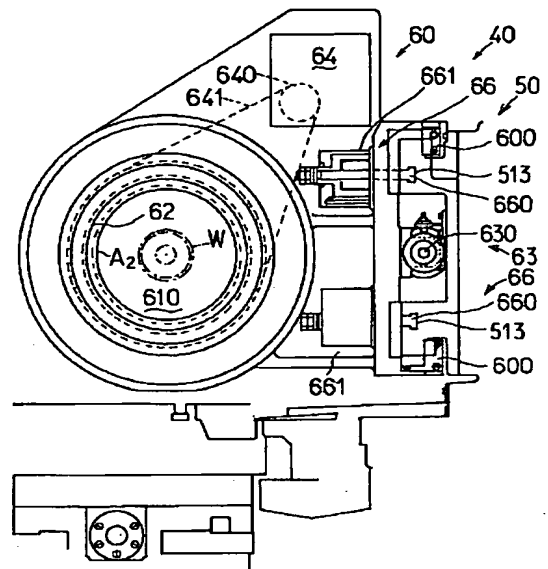
【図8】



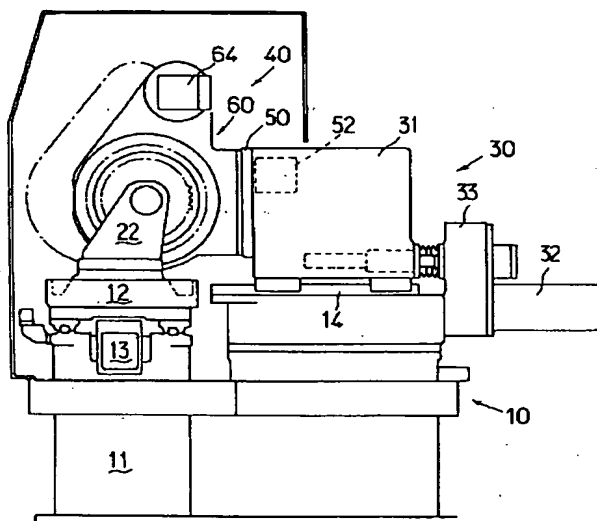
【図1】



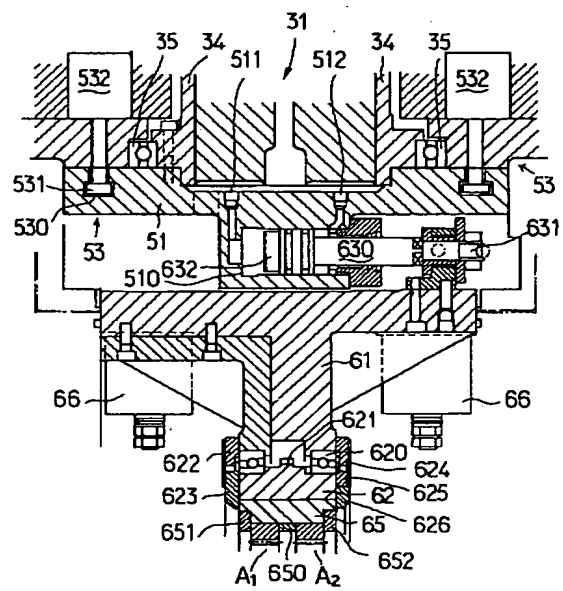
【図4】



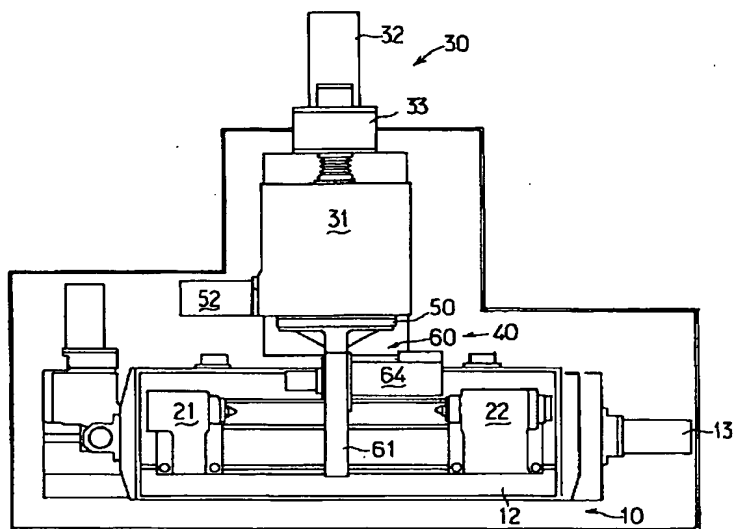
【図2】



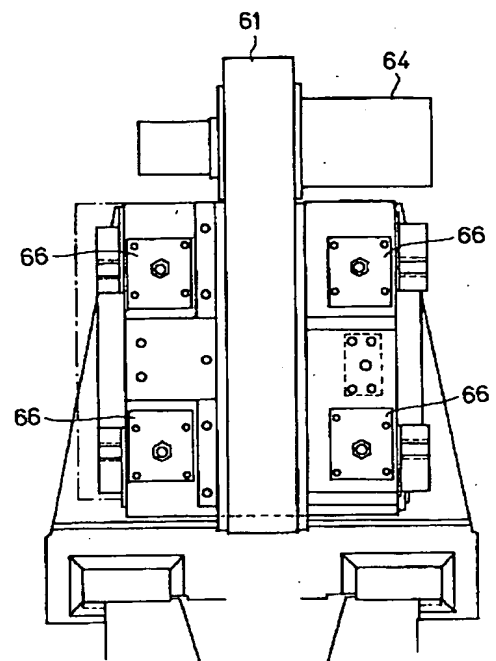
【図5】



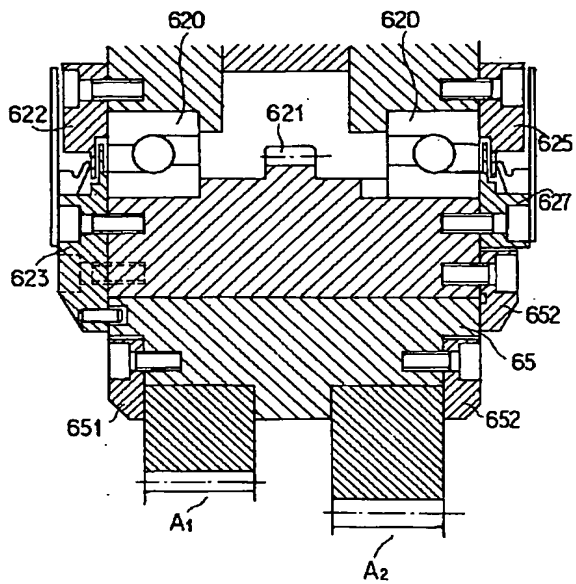
【図3】



【図6】



【図7】



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